

Claims

1. A dressing tool which performs the dressing of a working tool that has a doughnut disk-form or circular disk-form working surface, this dressing tool being characterized by the fact that the tool has a substantially rectangular dressing surface that performs dressing by contacting the working surface of the above-mentioned working tool, and the above-mentioned dressing surface is disposed so that the centerline of the above-mentioned dressing surface in the direction of the short sides of the above-mentioned substantially rectangular shape coincides with the radial direction passing through the center of the above-mentioned doughnut disk or circular disk of the above-mentioned working tool during dressing.
2. The dressing tool according to Claim 1, which is characterized by the fact that the shapes of both long sides of the above-mentioned substantially rectangular shape that extend parallel to the above-mentioned centerline in the direction of the short sides are shapes which are such that when the above-mentioned dressing surface is caused to contact the above-mentioned working surface, the contact length between the above-mentioned working surface and the above-mentioned dressing surface is equal at all positions in the radial direction of the above-mentioned working surface.

3. A dressing apparatus which is characterized by the fact that this apparatus has the dressing tool according to Claim 1, and a working tool holding mechanism which holds a working tool that has a doughnut disk-form or circular disk-form working surface, and which causes this working tool to rotate about an axis that passes through the center of the above-mentioned doughnut disk or circular disk perpendicular to the above-mentioned working surface.

4. The dressing apparatus according to Claim 3, which is characterized by the fact that this apparatus has a plurality of dressing tools, and these dressing tools are disposed so that the dressing tools simultaneously dress the above-mentioned working surface.

5. A working apparatus which has the above-mentioned working tool that is dressed by the dressing tool according to Claim 1.

6. A working apparatus which has the above-mentioned working tool that is dressed by the dressing apparatus according to Claim 3.

7. A dressing tool which is used to dress the working surface of a working tool that has a circular outer circumference, this dressing tool being characterized by the fact that the dressing tool comprises a dressing surface which is constructed from a circular region that has a first cutting capacity per unit area, and an annular region

that is concentric with the above-mentioned circular region and that has a second cutting capacity per unit area that is higher than the above-mentioned first cutting capacity per unit area, the diameter of the above-mentioned circular region of the above-mentioned dressing surface is greater than the effective use width within the radius of the above-mentioned working surface, and the external diameter of the above-mentioned annular region of the above-mentioned dressing surface is substantially half of the external diameter of the above-mentioned working surface.

8. A dressing tool which is used to dress the working surface of a working tool that has a circular outer circumference, this dressing tool being characterized by the fact that the dressing tool comprises a dressing surface which is constructed from a circular region in which abrasive grains are distributed at a first mean distribution density, and an annular region which is concentric with the above-mentioned circular region, and in which abrasive grains are distributed at a second mean distribution density that is higher than the above-mentioned first mean distribution density, the diameter of the above-mentioned circular region of the above-mentioned dressing surface is greater than the effective use width within the radius of the above-mentioned working surface, and the external diameter of the above-mentioned annular region of the above-mentioned dressing surface is substantially half of the external diameter of the above-mentioned working surface.

9. The dressing tool according to Claim 8, which is characterized by the fact that the above-mentioned first mean distribution density is 10% to 50% of the above-mentioned second mean distribution density.

10. A dressing apparatus which is characterized by the fact that this dressing apparatus comprises the dressing tool according to Claim 7, and a rotational mechanism which causes this dressing tool to rotate.

11. A dressing method which dresses the working surface of a working tool supported on a substrate by causing contact between this working surface and the dressing surface of a dressing tool and causing relative motion between the above-mentioned substrate and the above-mentioned dressing tool, this dressing method being characterized by the fact that this method comprises a setting stage in which the relative inclination of the above-mentioned dressing surface with reference to the above-mentioned substrate is adjusted to a desired inclination and set, and a dressing stage in which the above-mentioned working surface is dressed while maintaining the above-mentioned relative inclination set in the above-mentioned setting stage.

12. The dressing method according to Claim 11, which is characterized by the fact that the above-mentioned setting stage includes a stage in which information corresponding to the surface shape of the above-mentioned working surface is

obtained, and a stage in which the above-mentioned relative inclination is adjusted and set on the basis of the above-mentioned information.

13. The dressing method according to Claim 11, which is characterized by the fact that the above-mentioned setting stage and the above-mentioned dressing stage are alternately repeated a multiple number of times each until the surface shape of the above-mentioned working surface becomes a surface shape that is within the permissible range.

14. The dressing method according to Claim 11, which is characterized by the fact that the dressing of the above-mentioned working surface in the above-mentioned dressing stage is performed in a state in which a portion of the above-mentioned dressing surface protrudes from the circumference of the above-mentioned working surface.

15. The dressing method according to Claim 11, which is characterized by the fact that the above-mentioned relative inclination is an inclination about a specified axial line that is substantially perpendicular to a straight line passing through the vicinity of the center of the above-mentioned working surface and the vicinity of the center of the above-mentioned dressing surface.

16. A dressing apparatus which dresses the working surface of a working tool supported on a substrate by causing contact between this working surface and the dressing surface of a dressing tool and causing relative motion between the above-mentioned substrate and the above-mentioned dressing tool, this dressing apparatus being characterized by the fact that the apparatus comprises an inclination adjustment mechanism that can adjust the relative inclination of the above-mentioned dressing surface with reference to the above-mentioned substrate to a desired inclination and set this inclination, and a moving mechanism which dresses the above-mentioned working surface by causing relative motion between the above-mentioned substrate and the above-mentioned dressing tool while maintaining the above-mentioned relative inclination set by the above-mentioned inclination adjustment mechanism.

17. The dressing apparatus according to Claim 16, which is characterized by the fact that the dressing apparatus is an apparatus that dresses the working surface of a working tool that has a circular outer circumference, the above-mentioned dressing tool comprises a dressing surface which is constructed from a circular region that has a first cutting capacity per unit area, and an annular region that is concentric with the above-mentioned circular region and that has a second cutting capacity per unit area that is higher than the above-mentioned first cutting capacity per unit area, the diameter of the above-mentioned circular region of the above-mentioned dressing surface is greater than the effective use width within the radius

of the above-mentioned working surface, and the external diameter of the above-mentioned annular region of the above-mentioned dressing surface is substantially half of the external diameter of the above-mentioned working surface.

18. The dressing apparatus according to Claim 16, which is characterized by the fact that the dressing apparatus comprises a control part that operates the above-mentioned inclination adjustment mechanism on the basis of information corresponding to the surface shape of the above-mentioned working surface so that the above-mentioned relative inclination is a desired inclination.

19. The dressing apparatus according to Claim 18, which is characterized by the fact that the dressing apparatus comprises a measuring part that acquires the above-mentioned information.

20. A dressing apparatus which dresses the working surface of a working tool supported on a substrate by causing contact between this working surface and the dressing surface of a dressing tool and causing relative motion between the above-mentioned substrate and the above-mentioned dressing tool, this dressing apparatus being characterized by the fact that the apparatus comprises an inclination adjustment mechanism that can adjust the relative inclination of the above-mentioned dressing surface with reference to the above-mentioned substrate to a desired inclination and set this inclination, a moving mechanism which dresses

the above-mentioned working surface by causing relative motion between the above-mentioned substrate and the above-mentioned dressing tool while maintaining the above-mentioned relative inclination set by the above-mentioned inclination adjustment mechanism, a measuring part which acquires information corresponding to the surface shape of the above-mentioned working surface, and a control part which, in response to specified command signals, (i) causes the above-mentioned dressing to be performed by operating the above-mentioned moving mechanism, (ii) makes a judgement as to whether or not the above-mentioned relative inclination that is currently set is the desired inclination on the basis of the above-mentioned information acquired by the above-mentioned measuring part following the dressing performed in the above-mentioned (i), (iii) ends the adjustment of the above-mentioned relative inclination in cases where it is judged in the above-mentioned (ii) that the currently set inclination is the desired inclination, and (iv) repeats the operation from the above-mentioned (i) on after operating the above-mentioned inclination adjustment mechanism so that the above-mentioned relative inclination is adjusted to the desired inclination or an inclination that approaches this desired inclination in cases where it is judged in the above-mentioned (ii) that the currently set inclination is not the desired inclination.

21. The dressing apparatus according to Claim 20, which is characterized by the fact that the dressing apparatus is an apparatus that dresses the working surface of

a working tool that has a circular outer circumference, the above-mentioned dressing tool comprises a dressing surface which is constructed from a circular region that has a first cutting capacity per unit area, and an annular region that is concentric with the above-mentioned circular region and that has a second cutting capacity per unit area that is higher than the above-mentioned first cutting capacity per unit area, the diameter of the above-mentioned circular region of the above-mentioned dressing surface is greater than the effective use width within the radius of the above-mentioned working surface, and the external diameter of the above-mentioned annular region of the above-mentioned dressing surface is substantially half of the external diameter of the above-mentioned working surface.

22. The dressing apparatus according to Claim 16, which is characterized by the fact that the dressing of the above-mentioned working surface is performed in a state in which a portion of the above-mentioned dressing surface protrudes from the circumference of the above-mentioned working surface.

23. The dressing apparatus according to Claim 20, which is characterized by the fact that the dressing of the above-mentioned working surface is performed in a state in which a portion of the above-mentioned dressing surface protrudes from the circumference of the above-mentioned working surface.

24. The dressing apparatus according to Claim 16, which is characterized by the fact that the above-mentioned relative inclination is an inclination about a specified axial line that is substantially perpendicular to a straight line passing through the vicinity of the center of the above-mentioned working surface and the vicinity of the center of the above-mentioned dressing surface.

25. The dressing apparatus according to Claim 20, which is characterized by the fact that the above-mentioned relative inclination is an inclination about a specified axial line that is substantially perpendicular to a straight line passing through the vicinity of the center of the above-mentioned working surface and the vicinity of the center of the above-mentioned dressing surface.

26. A working apparatus which comprises a working tool that has a working surface, and a holding part that holds the workpiece, and which works the above-mentioned workpiece by applying a load between the above-mentioned working surface of the above-mentioned working tool and the above-mentioned workpiece and causing the relative motion of the above-mentioned working tool and the above-mentioned workpiece, this working apparatus being characterized by the fact that the above-mentioned working surface is dressed by the dressing method according to Claim 11.

27. A working apparatus which comprises a working tool that has a working surface, and a holding part that holds workpiece, and which works the above-mentioned workpiece by applying a load between the above-mentioned working surface of the above-mentioned working tool and the above-mentioned workpiece and causing the relative motion of the above-mentioned working tool and the above-mentioned workpiece, this working apparatus being characterized by the fact that the above-mentioned working surface is dressed by the dressing apparatus according to Claim 16.

28. A working apparatus which comprises a working tool that has a working surface, and a holding part that holds the workpiece, and which works the above-mentioned workpiece by applying a load between the above-mentioned working surface of the above-mentioned working tool and the above-mentioned workpiece and causing the relative motion of the above-mentioned working tool and the above-mentioned workpiece, this working apparatus being characterized by the fact that the above-mentioned working surface is dressed by the dressing apparatus according to Claim 20.

29. A working apparatus which comprises a working tool that has a working surface, and a holding part that holds the workpiece, and which works the above-mentioned workpiece by applying a load between the above-mentioned working surface of the above-mentioned working tool and the above-mentioned workpiece

and causing the relative motion of the above-mentioned working tool and the above-mentioned workpiece, this working apparatus being characterized by the fact that the apparatus comprises the dressing apparatus according to Claim 16.

30. A working apparatus which comprises a working tool that has a working surface, and a holding part that holds the workpiece, and which works the above-mentioned workpiece by applying a load between the above-mentioned working surface of the above-mentioned working tool and the above-mentioned workpiece and causing the relative motion of the above-mentioned working tool and the above-mentioned workpiece, this working apparatus being characterized by the fact that the apparatus comprises the dressing apparatus according to Claim 20.

31. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 5.

32. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 6.

33. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 26.

34. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 27.

35. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 28.

36. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 29.

37. A semiconductor device manufacturing method which is characterized by the fact that this method has a process in which the surface of a semiconductor wafer is flattened using the working apparatus according to Claim 30.